

## NOTES ON VARIATION IN TITHONIA TUBAEFORMIS

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The following notes on variation in *Tithonia tubaeformis* (Jacq.) Cass. were made in S. P. Tlaquepaque, Jalisco, Mexico, where that species grows abundantly along roadways and along the edges of cultivated fields. They were made to supplement the herbarium specimens taken at the same time which have been deposited in the herbarium of the Missouri Botanical Garden.

There is a good deal of variation in form and color from plant to plant as well as on different parts of the same plant. The most conspicuous is in the color of the disk flowers. One form, the commoner, has orange-red on the outside of the disk corollas and on the tips of the chaff of the receptacle. The corolla of the other is dark red, and the difference between the two forms is independent of the age and development of the flower head and is not correlated with the color of the stamens. This same discontinuous variation was noted in other parts of Jalisco.

There is much variation also in the size and shape of the rays and of the involucre bracts. Twenty well-developed plants were examined, and a head terminal to a secondary branch was chosen from each. Heads with about half the disk in flower were selected, eliminating a good deal of the variation caused by different stages of development. Color of disk flowers, number of rays, and length and width of an average ray were recorded for each head. The results are shown in fig. 1. The rays vary from  $2\frac{1}{4}$  to  $3\frac{1}{2}$  times as long as broad. There is a tendency for many-rayed plants to have smaller rays and for few-rayed plants to have larger rays. In this sample the three plants with dark disks were among those with fewer, larger rays.

Though *Tithonia tubaeformis* is seldom actually planted as an ornamental, it is on the border-line between a cultivated plant and a weed. It comes up in fenced-in gardens and is so often allowed to develop that its orange-yellow flowers are the dominant color note of many little villages in October and November. The seeds apparently are not gathered but the whole plant is frequently cut for coarse hay used in packing, etc.

Figure 1 and the accompanying article are merely a demonstration of the way in which the essential facts regarding variation in a population can be compressed into one diagram which serves as an exact record of the essential facts and a tool in analysis. Selecting flower heads in the manner described removed much of the non-genetic variability. Plant-to-plant variation was then found to be largely concentrated in (1) ray size, (2) ray shape, (3) ray number, (4) corolla color. The inter-relations of all four of these variables are shown in fig. 1. The broken lines for length-breadth proportions have been drawn in as a visual aid in translating position on the chart into ray-shape.



Each circle represents the data from one head, selected one to a plant. Heavy-lined circles represent plants with dark red corollas, the others represent yellow corollas. The figures inside the circles are the number of ray flowers. The position of the circles with regard to the vertical and horizontal scales indicates ray length and breadth respectively.

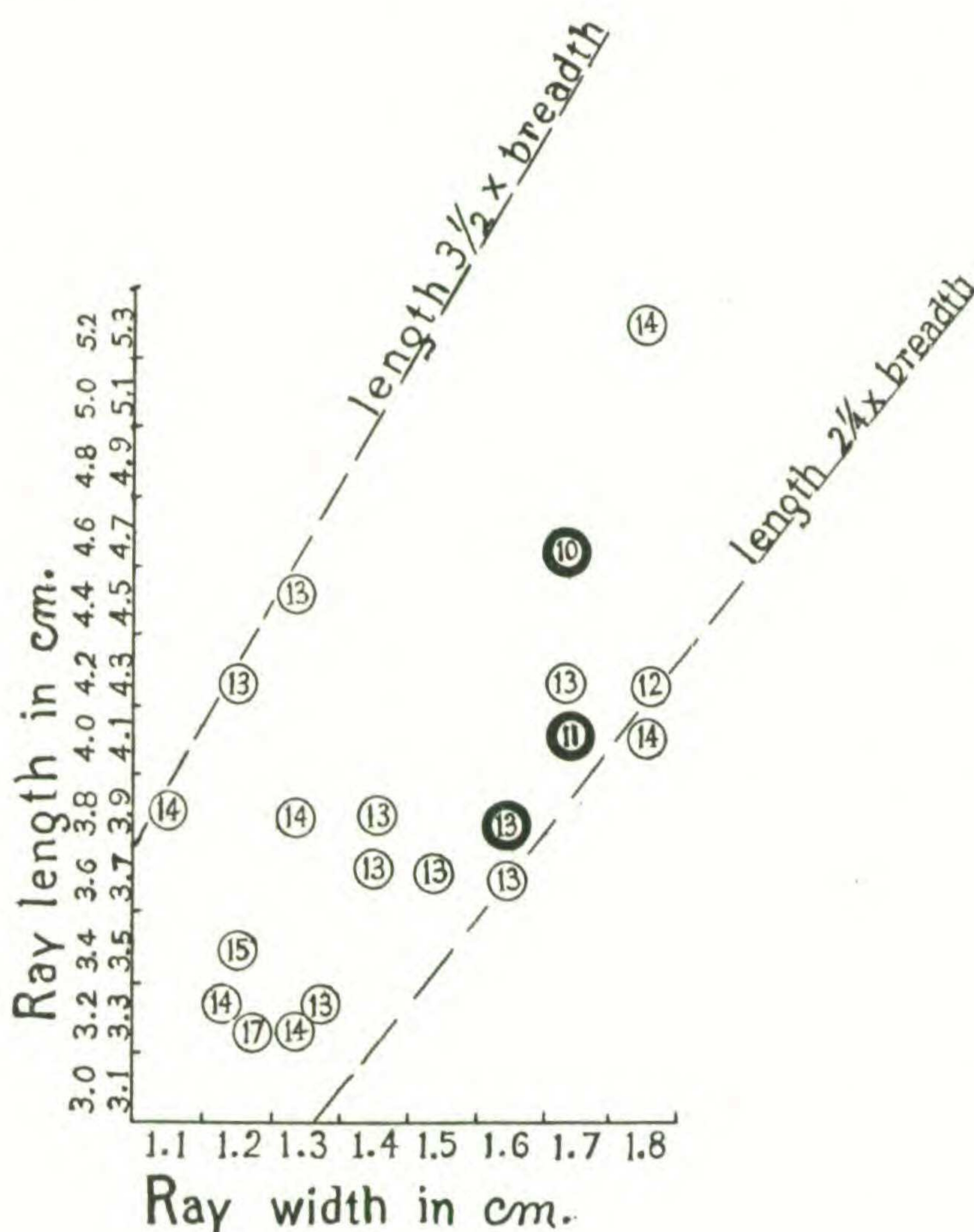


Fig. 1. Variation in ray number, ray length, ray width, and corolla color among 20 plants of *Tithonia tubaeformis* from one locality. Further explanation in the text.

A single chart of this sort is little more than an accurate record of 80 different facts (4 each for 20 plants) and their inter-relationships. A series of such charts for different populations of this species, or comparable charts for other species of *Tithonia*, would allow us to make a real study of evolution in this group of plants. While this method of recording variation was worked out for *Tithonia* it would certainly be quite as effective with the annual species of *Helianthus* and probably with a good many other composites.